



S10

Safety Interlocking Device

Technical Description



About this technical description

This description contains information regarding the proper and effective use of the safety interlocking devices S10.

Safety precautions and warnings are designated by the symbol.



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1 Safety Interlocking Device S10

“Interlocking device without guard locking” (European Standard EN 1088)

1.1 Safety Features



- Protects humans from dangerous movements in the operating range of industrial machinery and systems.
- Safety interlocking devices for monitoring the position of protective devices and for electrically interlocking such devices (e.g. safety doors).
- Protective device monitors (according to EN 954-1): Safety interlocking devices are not assigned to a safety category (SC). They can merely fulfill the requirement set by particular categories for integration into safety circuits. Connections examples for SC 1 to 4 are given in Section 3.2.
- The interlocking device and the actuator are not constructively connected to each other. As a result of the operating procedure using a separate actuator, it follows that:
 - When the protective device is opened during the dangerous machine movement, a safety stop command is triggered (i.e. the safety contacts open).
 - The machine is unable to perform a dangerous movement when the protective devices are open.

1.2 Functional and Constructive Features

- Plastic-enclosed version
- Actuating heads can be displaced $4 \times 90^\circ$
- Funnel-shaped entry opening for the actuator
- Ball lock in the actuating head for fixing the actuator
- Variable actuating radius possible with radial actuator (see page 17 – Notes Regarding Minimum Radii)

1.2.1 Dimensions

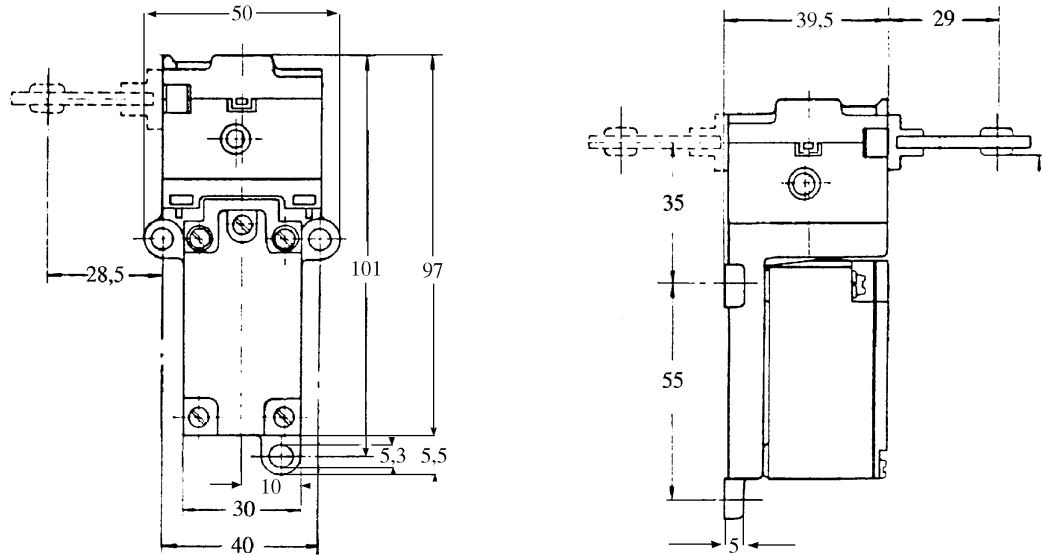


Fig. 1 Dimensions – safety interlocking device S10

1.2.2 Contact Layout

Assignment:

- Normally closed contact 11-12 (21-22) ⇒ safety contact for the safety message circuit;
- Normally open contact 23-24 ⇒ feedback contact;

1.2.2.1 Slide Contact

- Positively opening safety interlocking device with slide function

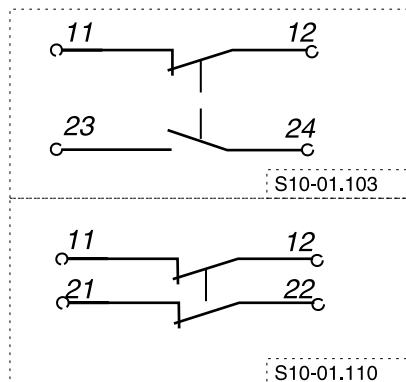


Fig. 2 S10 contact layout - slide function

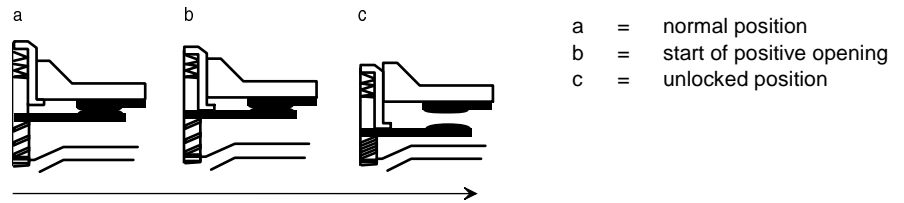


Fig. 3 Positive opening path – S10 with slide funktion

1.2.2.2 Snap Contact

- Positively opening safety interlocking device with snap function. If the snap function fails, positive opening takes effect.

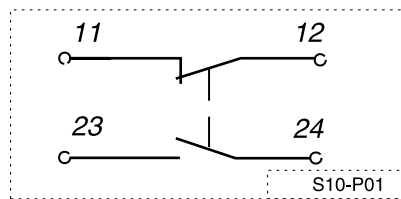


Fig. 4 S10 contact layout - snap function

- Snap function prevents contact chatter

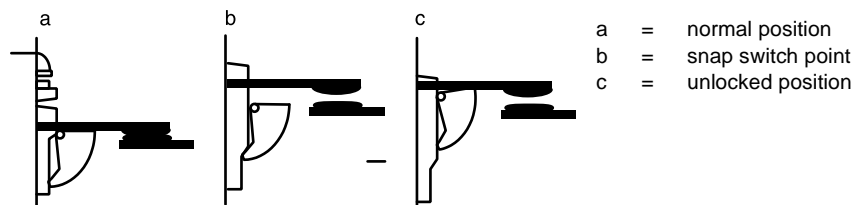


Fig. 5 S10 with snap fun

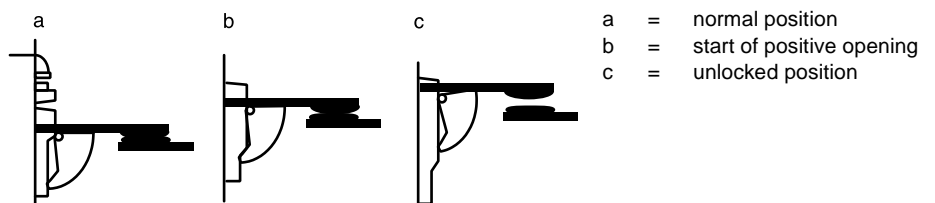



Fig. 6 Switch function if the snap switch fails (positive opening)

Application:

- In general, the two switch function versions of the S10 can be implemented equally.
- During an extremely slow opening movement, e.g. of a pivoting safety door, contact chatter is possible in the version equipped with slide contacts. This can cause disturbances in the downstream controls (e.g. an unexpected start when the safety relay module has an “automatic restart” function).

1.3 General Mounting Instructions for Series S10

Installation position	Any chosen position. The actuating head, however, should be positioned so that it is protected from direct exposure to flying chips, cooling and cutting oils, etc.
Attachment - actuator	2 x one-way screws M4 with washers (enclosed) or corresponding rivet. It must be impossible to dismantle the actuator key using simple means.
Setup and position - S10 	<p>The devices may not be used as a dead stop for the door.</p> <p>Place the S10 at the closing edge of doors, hinged covers and sliding grids.</p> <p>The coded actuator must be precisely guided into the S10 switch opening.</p> <p>In the S10 versions, the ball lock in the actuating head allows the door to be positioned. The door's end position should be adjusted onto the ball lock. Do not fall below the minimum swivelling radius of doors and hinged covers as specified by the manufacturer.</p> <p>Positively attach the actuator to the protective device.</p> <p>Secure the attachment elements of the S10 and the actuator so as to prevent self-loosening.</p> <ul style="list-style-type: none"> • Use sufficient shielded wiring.
Attachment – S10	Use screws 3 x M5 DIN 912 and spring washers.
Attachment - actuating head	The enclosed one-way screws can be used instead of the standard screws provided in the actuating head. This prevents the actuating head from being manipulated after installation has been completed. The advantages of being able to displace the heads, depending on the conditions for installing the devices, and of the simplified bearing support can be fully maintained.

1.3.1 Measures Against Defeating Safety Interlocking Devices (according to EN1088)



In order to prevent simple manipulation (with screwdrivers, bent wires and the like), the actuators are given multiple codes and the actuating heads of the devices, among others, are equipped with locking discs.

In case of elevated risk (if used for SC 3 (4)), additional measures against defeat are advisable:

- If the one-way screws (included in delivery) are used, the actuators create an indissoluble connection to the separating safety door.
- A concealed installation can hinder the insertion of “substitute actuators” and at the same time provide increased protection against damage (see Fig. 7):

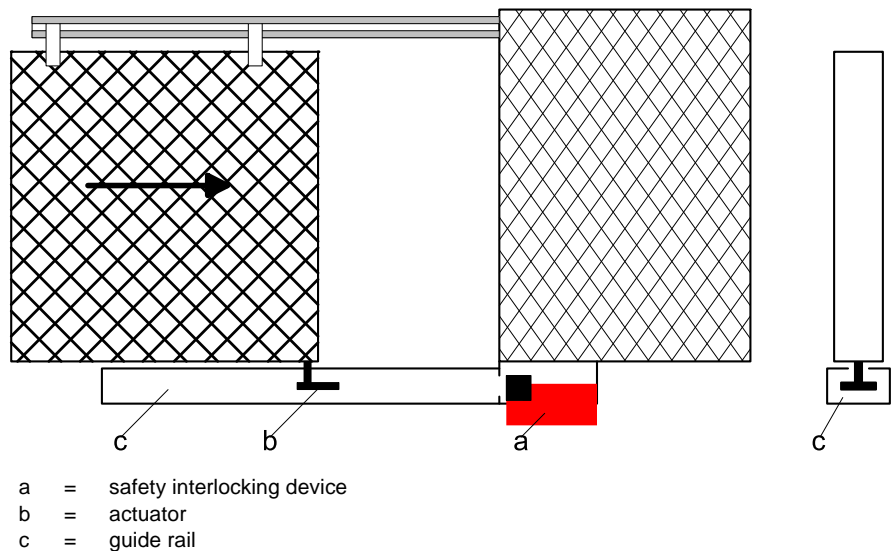


Fig. 7 Example of mounting: “Concealed installation”

1.4 Delivery Overview

Safety interlocking devices, Series S10, with accessories

Type	Contact Components	Order No.
Safety interlocking device without guard locking		
S10-01.103	Slide contacts: 1 NC contact / 1 NO contact	640000
S10-01.110	Slide contacts: 2 NC contacts	640001
S10-P01	Snap contacts: 1 NC contact / 1 NO contact	640002

Delivery does not include the actuators of the safety guard interlocks S 10, L 30 and L 50.

Accessories

Type	Feature	Order No.
Actuator		
CO-S10-L50	Actuator, standard	640049
COR-S10-L50	Radial actuator	640055
CW-S10-L50	Actuator, angled	640056
CWR-S10-L50	Radial actuator, angled	640057
COF/HIS.1-S10-L50	Telescope actuator, attached from behind	640058
COF/HIS.2-S10-L50	Telescope actuator, attached from above	640059
CK-S10-L50	Shortened actuator	640060
CWK-S10-L50	Shortened actuator, angled	640061
Safety Door Bolt		
BL-S10	Safety door bolt with angle plate attachment	640040

1.5 Technical Data

Standards /Specifications

Industrial switch gear - positively opening	In accordance with IEC 947; EN 60947; DIN VDE 0660
Interlocking device without guard locking	In accordance with EN 1088

Mechanical Data

Enclosure rating	IP 67
Ambient temperature range	-25° C ... +70° C
Housing material	Glass-fiber reinforced thermoplastic material, self-extinguishing, hardly flammable
Sealing	Perbunan, resistant to liquid fuels and oil
Cable entries	1 x PG 13,5
Connection types	Screw terminals, 0.5 mm ² .. 2.5 mm ² rigid or .. 1.5 mm ² flexible

Connection designations	DIN EN 50 005/50 013
Installation position	Any chosen position ¹⁾
Mechanical serviceable life	min. 1 x 10 ⁶ switching cycles
Switching frequency	6.000 cycles/h
Actuating force	Insertion: 10 N, withdrawal: 20 N
Shock resistance	> 30 g/18 ms
Vibration resistance	> 15 g/10 ... 200 Hz
Climatic resistance	Conforms to DIN EN 60 068 Part 2-30

- ¹⁾ The entry openings for the actuator should, however, be positioned in such a way that they are protected from coarse dirt and moisture.

Electrical Data

Utilization category in accordance with DIN VDE 0660/part 200	AC-15/ 250 V AC/ 8 A; DC-13/ 24 V DC/ 5 A (S10-P01: AC-15/ 250 V AC/ 6 A; DC-13/24 V DC/ 4 A)
Contact material	Fk-Ag, silver-plated, passivated
Switching of small loads	24 V/10 mA
Rated isolated voltage U _{ri}	440 V, test voltage 2,500 V
Thermal rated performance	max. 10 A (S10-P01: max. 6 A)
Clearance and creepage distance in accordance with DIN VDE 0110	Pollution degree 3 over-voltage category III
Proof of positive opening	2.5 kV impulse voltage
Positive opening path	Door monitoring: approx. 2 x 3.5 mm
Short circuit protection	gG 10 A (S10-P01: gG 6 A)
Approvals	BIA, UL, CSA

2 Accessories

2.1 Separate Actuators for Series S10 and L50

2.1.1 Features

- Separate actuators for safety interlocking devices
- Rubber buffers with integrated spacer sleeves compensate for tolerances between the guideway of the movable protective device and the entry opening for the actuating heads.
- Actuator key has 11 mm of leeway when the safety interlocking devices are in the interlocked state.
- Integrated auxiliary stop at the end of the actuator shaft prevents possible damage.

2.1.2 Technical Data

Actuator	Galvanized steel
Auxiliary stop	Glass-fiber reinforced, thermoplastic material, self-extinguishing
Rubber buffers	Perbunan, resistant to liquid fuels and oil

2.1.3 Dimensions

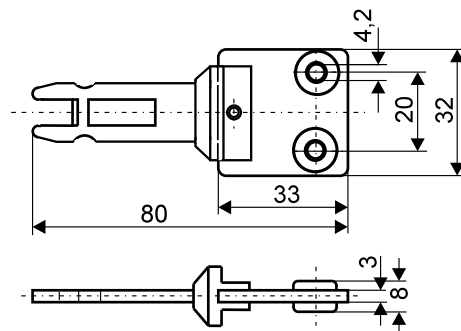


Abb. 8 Actuator: **CO-S10-L50***

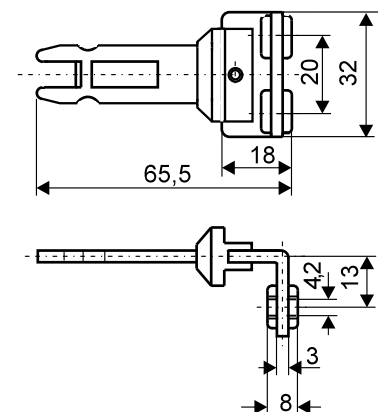


Abb. 9 Actuator, angled:
CW-S10-L50*

*Mounting notes regarding minimum radii for pivoting protective devices, page 17

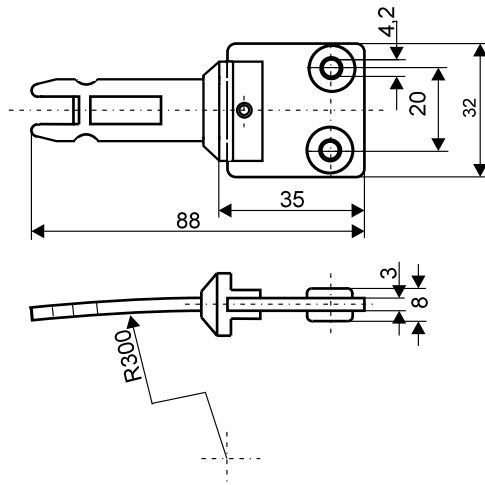


Abb. 10 Radial actuator:
COR-S10-L50*

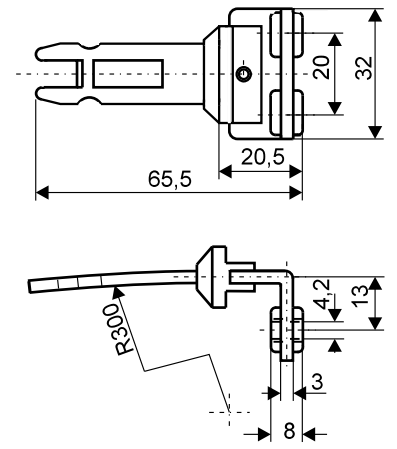


Abb. 11 Radial actuator, angled:
CWR-S10-L50*

*Mounting notes regarding minimum radii for pivoting protective devices, page 17

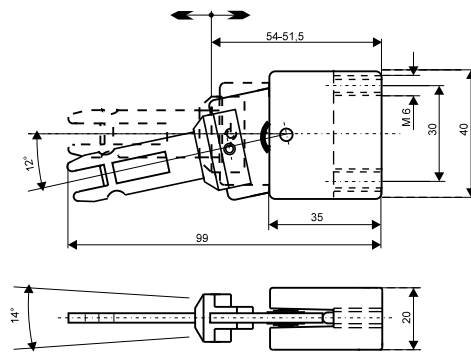


Abb. 12 Telescope actuator:
COF/HIS.1-S10-L50*
attached from behind

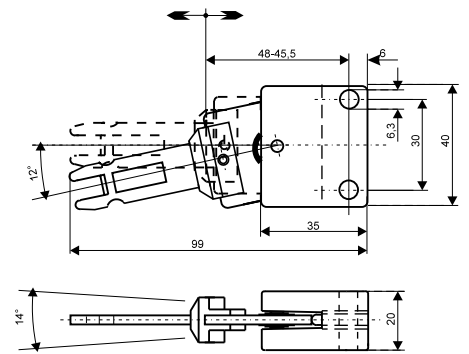


Fig. 13 Telescope actuator:
COF/HIS.2-S10-L50*
attached from above

*Mounting notes regarding minimum radii for pivoting protective devices, page 17

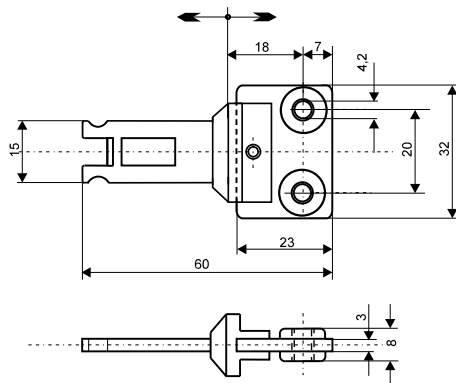


Fig. 14 Shortened actuator:
CK-S10-L50*

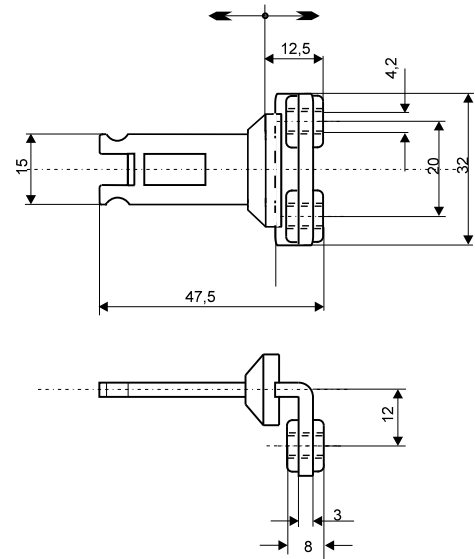



Fig. 15 Shortened actuator, angled:
CWK-S10-L50*

*Mounting notes regarding minimum radii for pivoting protective devices, page 17

Shortened construction design results in:

- Actuator leeway reduced from 11 mm to 4 mm
- Reduced actuating radius possible (see page 17)
- Actuator tips no longer jut out from the back of the actuating head
- Increase in the maximum extraction forces due to the much shorter operating path for safety interlocking devices.

Legend: „Basic dimensions of actuator“ 

2.2 Safety Door Bolts for Series S10

2.2.1 Features

- Safety door bolts for attaching safety interlocking devices, Series S10
- Suitable for use with sliding and pivoting protective devices (e.g. safety doors).
- Suitable for use with right- and left-stopped safety doors.
- Can be mounted to commonly used aluminum profiles, square pipes and machine cover panels.
- Delivery includes door bolt along with actuator and mounting angle for Series S10.

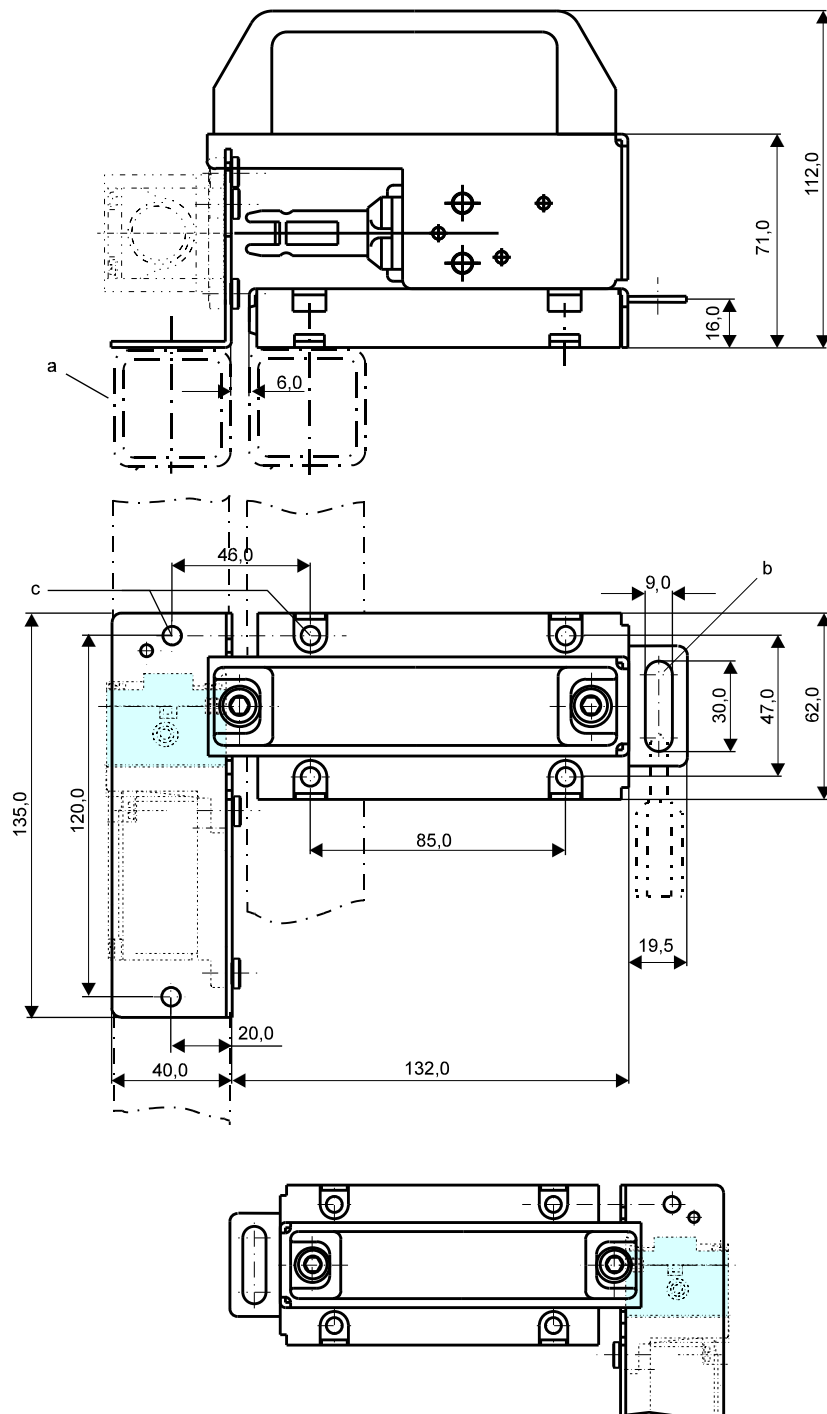
2.2.2 General Advantages

- No need for the user to make mechanical adaptations (i.e. to adjust the actuator).
- No need for a mechanical end stop to protect interlocking devices S10 from damage.

2.2.3 Safety Advantages

- If a protective device closes accidentally, in particular a revolving door, electrical interlocking cannot be enabled unless the bolt with the actuator is inserted into the S10 interlocking device.
- Service personnel working in the hazardous area can protect themselves by making sure that the dangerous machinery cannot be set into motion inadvertently. To do so, the BL-S10 must be equipped with a slot where a shackle-type lock can be attached. It is not possible for unauthorized individuals to close the protective device unexpectedly when the shackle-type lock is in place.

2.2.4 Dimensions

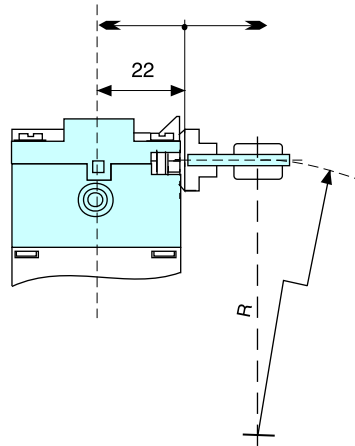


- a = safety lattice frame, e.g. 40x40 mm
- b = slot for a max. of 3 shackle-type locks with 6 mm shackle diameter
- c = mounting holes AE 6.2

Fig. 16 Safety Door Bolt **BL-S10**
Mounting configuration for right-stopped and left-stopped doors

3 Appendix

3.1 Mounting Notes Regarding Minimum Radii for Pivoting Protective Devices



R = Radius

Fig. 17

CO-S10-L50: R > 270 mm
 COR-S10-L50: R > 200-300 mm
 CK-S10-L50: R > 160 mm

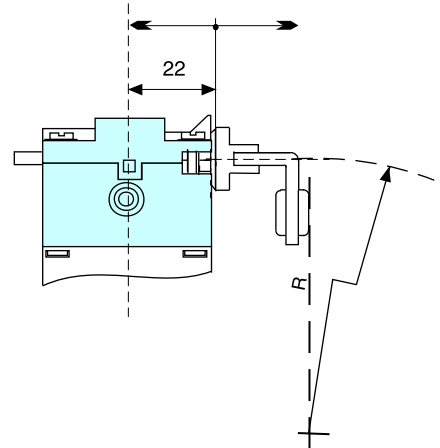
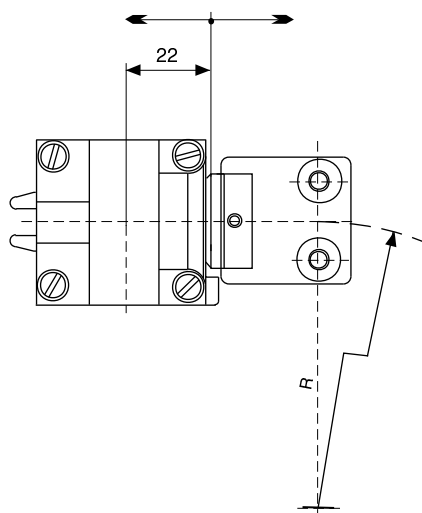


Fig. 18

CW-S10-L50: R > 270 mm
 CWR-S10-L50: R > 200-300 mm



R = Radius

Fig. 19

CO-S10-L50: R > 330 mm

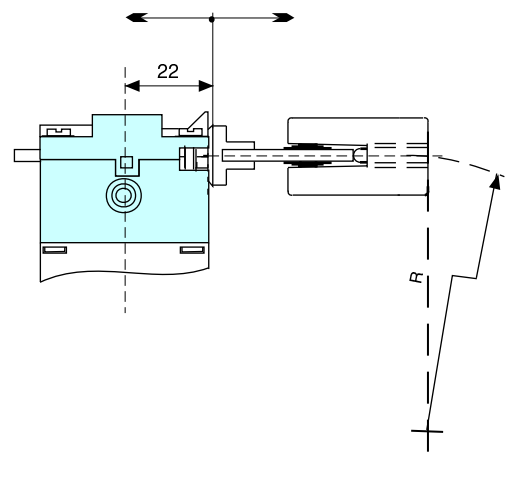
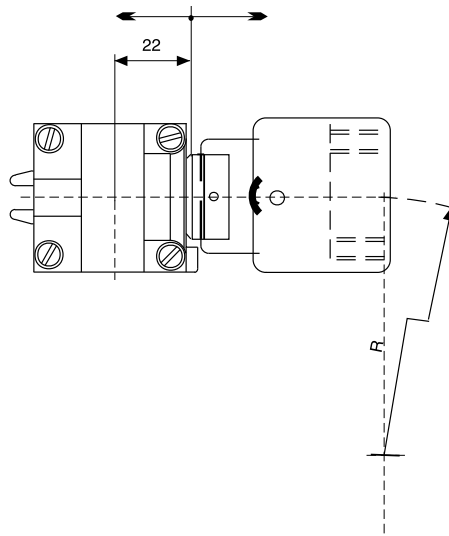


Fig. 20

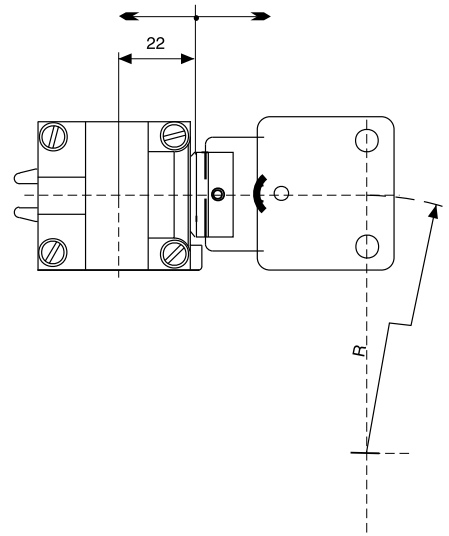
COF/HIS.1-S10-L50: R > 350 mm



CW-S10-L50: R > 300 mm
 CK-S10-L50: R > 250 mm

R = Radius

Fig. 21
 COF/HIS.1-S10-L50: R > 450 mm



COF/HIS.2-S10-L50: R > 350 mm

Fig 22
 COF/HIS.2-S10-L50: R > 400 mm

3.2 Connection Examples

Corresponding to a risk assessment as specified in EN 954-1A, a safety category is determined for devices intended to protect humans at production systems. The contacts of the safety interlocking devices function as the interface to the safety relay modules in the machine controls. The circuit diagrams below show wiring examples for connecting safety interlocking devices with MSI safety relay modules, classified by safety category (1 – 4).

(For the configurations and technical data related to the MSI safety relay modules, refer to the Connection and Operating Instructions for MSI-SR1 and MSI-SR2)

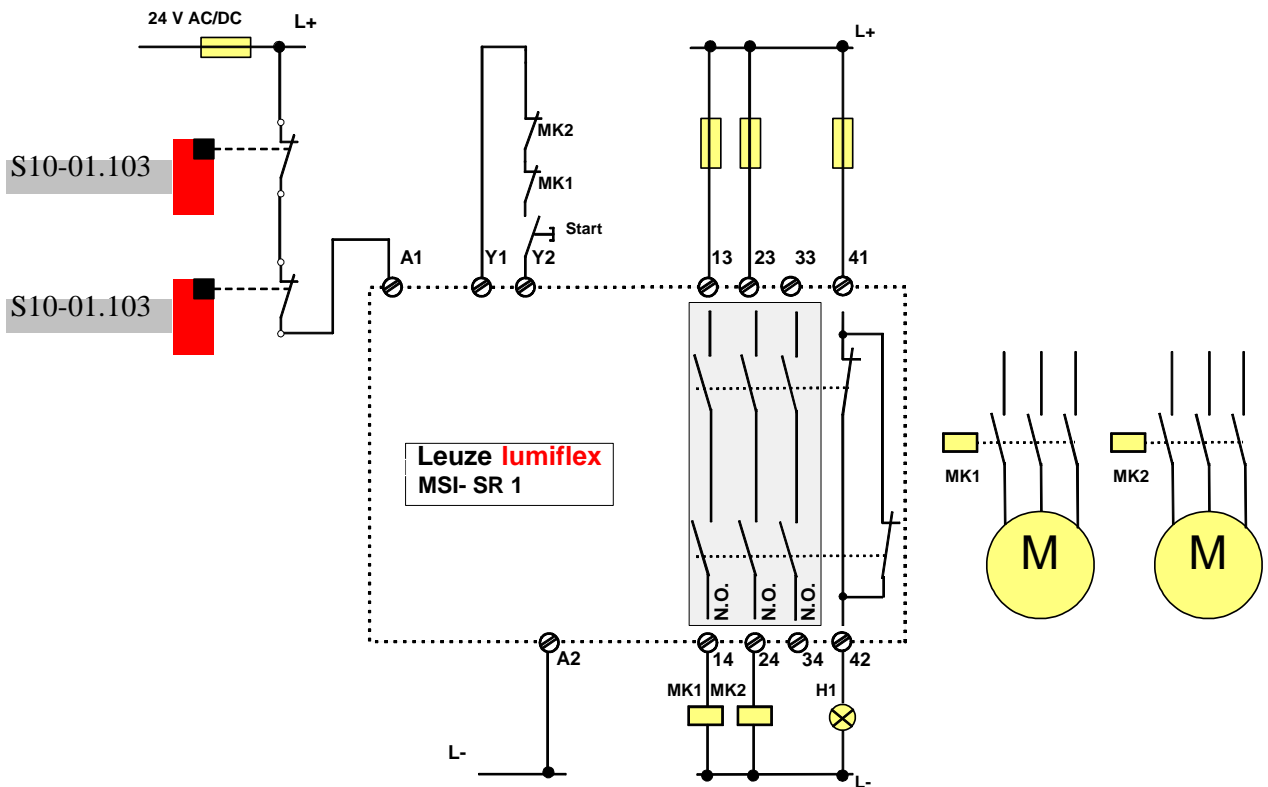
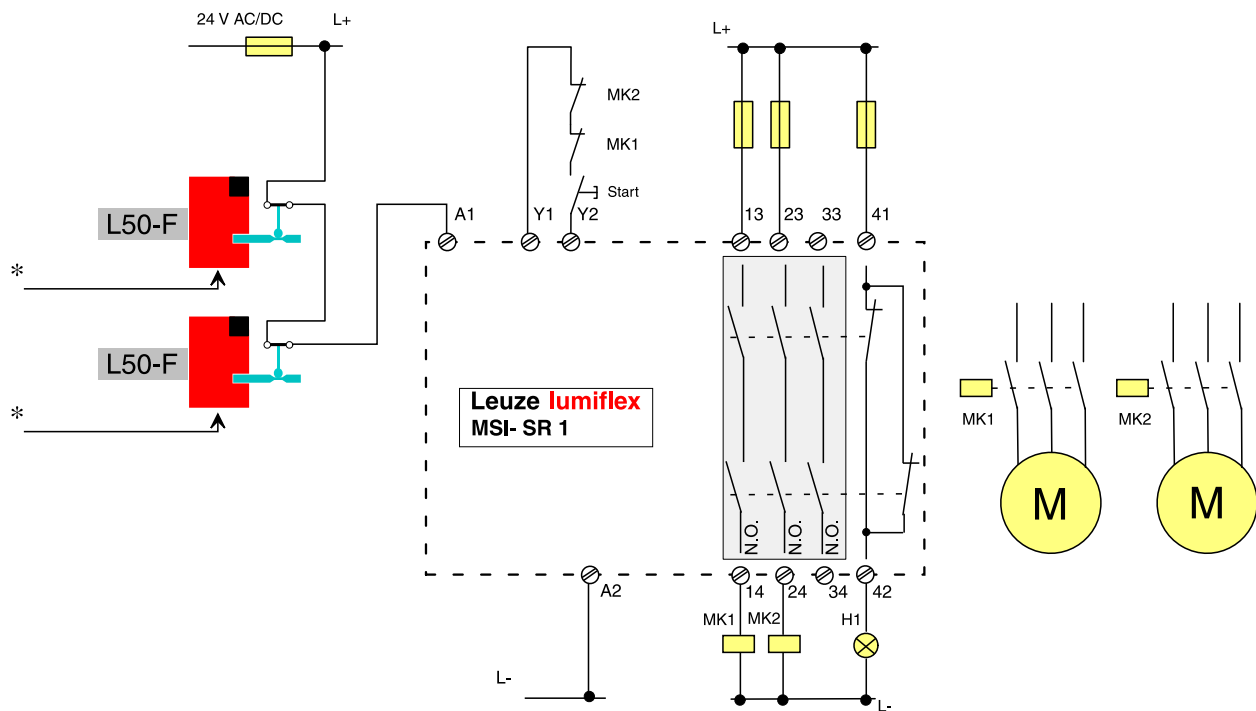


Fig. 23 Safety door monitoring in safety category 2 (1) according to EN 954-1

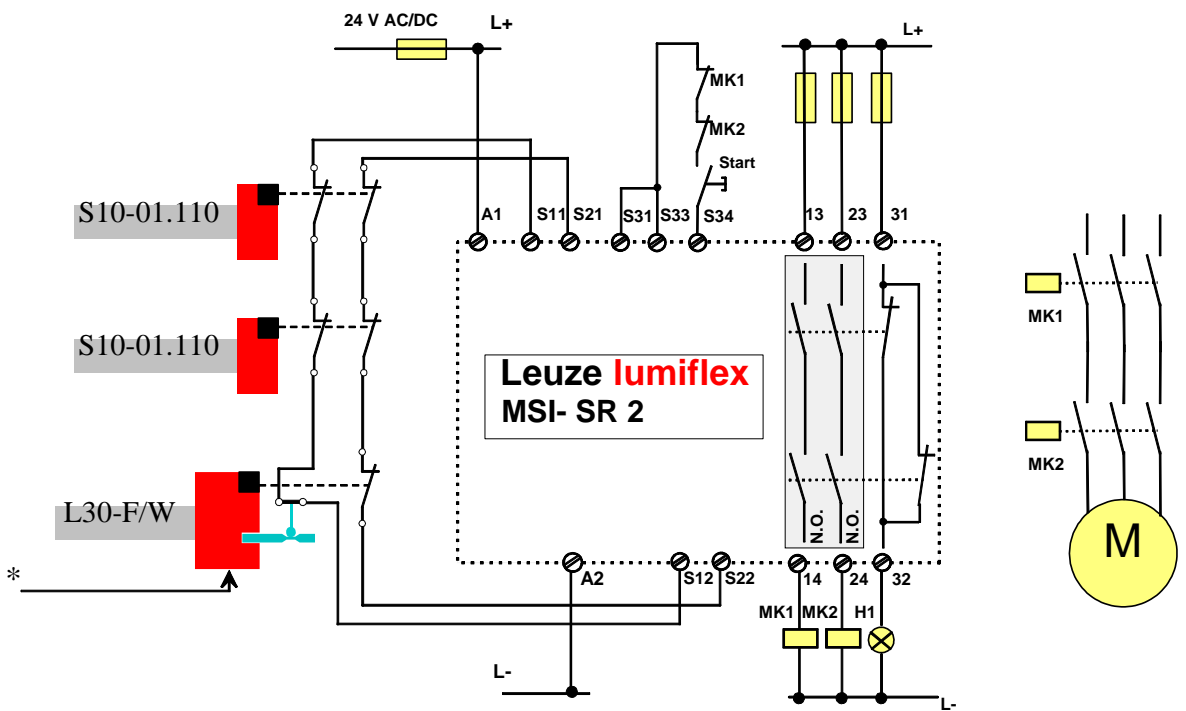
- MSI-SR1, single-channel
- Combination of several safety doors, each with 1 safety interlocking device S10 (S40)



* Separate magnet voltage supply (24V DC) serves as the guard locking signal by way of a time-delayed enabling circuit or stoppage control circuit – see Technical Description of safety interlocking device L50(L30).

Fig. 24 Safety door monitoring with guard locking in safety category 2 (1) according to EN 954-1

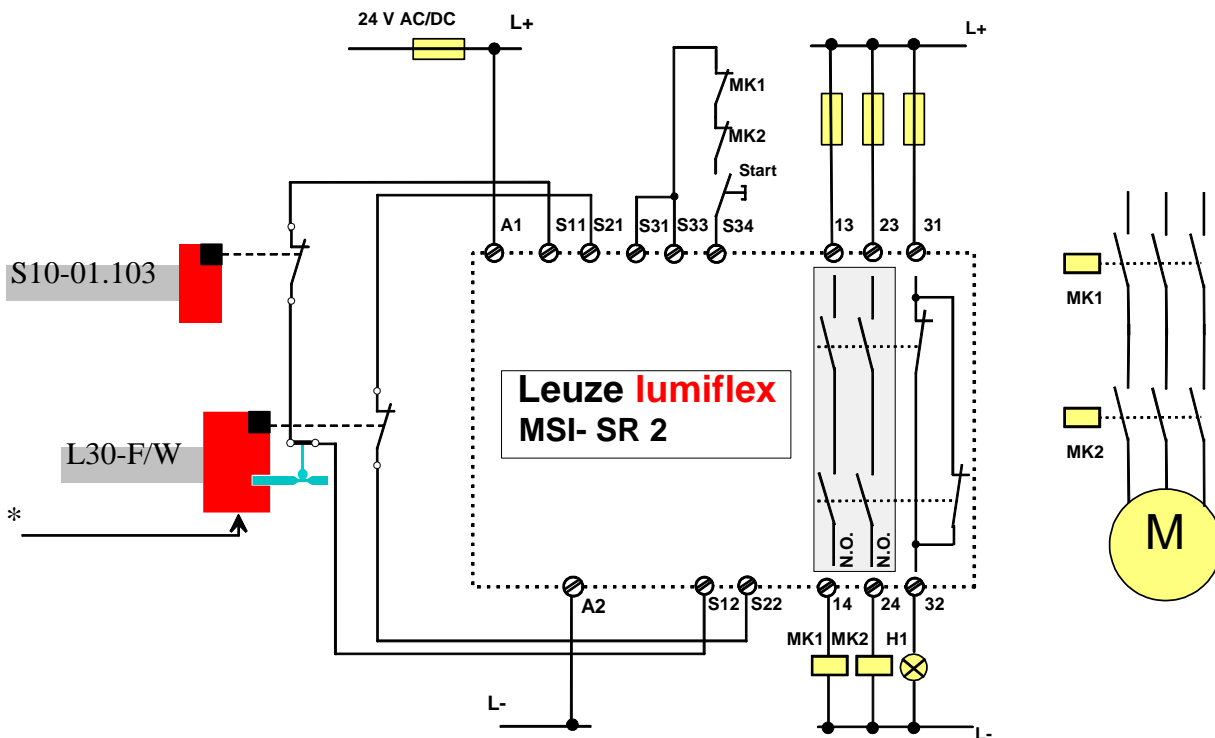
- MSI-SR1, single-channel
- Combination of several safety doors, each with 1 safety interlocking device with guard locking L50 (L30)



* Separate magnet voltage supply (24V DC) serves as the guard locking signal by way of a time-delayed enabling circuit or stoppage control circuit – see Technical Description of safety interlocking device L50(L30).

Fig. 25 Safety door monitoring with/without guard locking, combined, in safety category 3 according to EN 954-1

- MSI-SR2, dual-channel (with cross circuit monitoring - for safety category 4)
- Combination of several safety devices, each with 1 safety interlocking device with/without guard locking S10(S40) and L30 (L50) combined



* Separate magnet voltage supply (24V DC) serves as the guard locking signal by way of a time-delayed enabling circuit or stoppage control circuit – see Technical Description of safety interlocking device L50(L30).

Fig. 26 Safety door monitoring with guard locking in safety category 4 according to EN 954-1

- MSI-SR2, dual-channel with cross circuit monitoring
- 1 safety interlocking device with guard locking L30(L50) and 1 safety interlocking device S10 (S40) per safety door

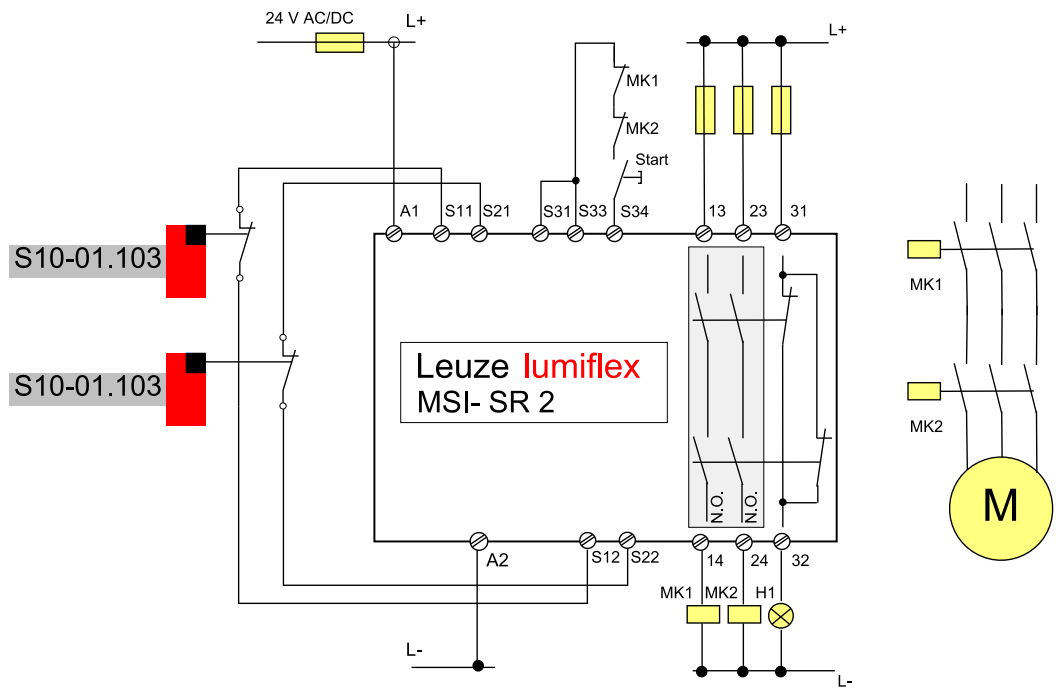


Fig. 27 Safety door monitoring in safety category 4 according to EN 954-1

- MSI-SR2, dual-channel with cross circuit monitoring
- 2 safety interlocking devices S10 (S40) per safety door with only 1 NC-contact per S10 (S40)



To ensure trouble-free operation, the cables used for connecting the safety interlocking devices to the MSI safety relay modules may not exceed specific lengths. For more information, refer to the admissible input cable resistance values in the Technical Data section of the connection and operating instructions for MSI-SR1 and MSI-SR2.

